

SEQUENCE LISTING

<110> Pasamontes, Luis  
Tsygankov, Yuri

<120> Fermentative Carotenoid Production

<130> 15464 US (C38435/125944)

<140> 09/920,923  
<141> 2001-08-02

<150> 08/980,832  
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<170> PatentIn version 3.1

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Val Leu Met Leu Met Val Ala Glu Ser Ser Gly Gly Val Cys Asp Ala  
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Met Val Asp Ala Ala Cys Ala Val Glu Met Val His Ala Ala Ser Leu  
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Ile Phe Asp Asp Met Pro Cys Met Asp Asp Ala Arg Thr Arg Arg Gly  
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Gln Pro Ala Thr His Val Ala His Gly Glu Gly Arg Ala Val Leu Ala  
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Gly Ile Ala Leu Ile Thr Glu Ala Met Arg Ile Leu Gly Glu Ala Arg  
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Ala Met Gly Pro Val Gly Leu Cys Ala Gly Gln Asp Leu Asp Leu His  
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Ala Pro Lys Asp Ala Ala Gly Ile Glu Arg Glu Gln Asp Leu Lys Thr  
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Leu Asp Lys Ala Glu Thr Glu Gln Leu Met Ala Phe Gly Arg Gln Leu  
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Gly Arg Val Phe Gln Ser Tyr Asp Asp Leu Leu Asp Val Ile Gly Asp  
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Lys Ala Ser Thr Gly Lys Asp Thr Ala Arg Asp Thr Ala Ala Pro Gly  
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Pro Lys Gly Gly Leu Met Ala Val Gly Gln Met Gly Asp Val Ala Gln  
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His Tyr Arg Ala Ser Arg Ala Gln Leu Asp Glu Leu Met Arg Thr Arg  
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Asp Gly Gln Val Met Gly Ser Ala Pro Glu Ala Gly Gly Asp Pro Gln  
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Asp Gly Pro Met Ser Pro Pro Phe Ala Ala Leu Arg Gln Val Ala Arg  
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Arg His Asp Phe Pro Asp Leu Trp Pro Met Asp Leu Ile Glu Gly Phe  
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Gly Ala Thr Val Glu Gly Pro Val Pro Ser Asp Ala Leu Tyr Ser Val  
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Gln Gly Leu Pro His Leu Pro Pro Arg Cys Ala Trp Ser Ile Ala Ala  
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Pro Glu Ala Tyr Arg Gln Arg Ile Ser Thr Ser Lys Ala Ala Lys Ile  
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Val Phe Asp Ala Gly Pro Thr Val Val Thr Asp Pro Asp Ser Leu Arg  
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Glu Leu Trp Ala Leu Ser Gly Gln Pro Met Glu Arg Asp Val Thr Leu  
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Arg Arg Gly Gly Val Trp Phe Ala Lys Gly Gly Thr Asn Gln Leu Val  
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Asn Gly Asp Val Met His Ser Tyr Arg Asp Leu Leu Gly His Thr Arg  
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Ala His His Ser Val Ile Phe Gly Pro Arg Tyr Lys Gly Leu Val Asn  
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Glu Ile Phe Asn Gly Pro Arg Leu Pro Asp Asp Phe Ser Met Tyr Leu  
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His Ser Pro Cys Val Thr Asp Pro Ser Leu Ala Pro Glu Gly Met Ser  
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Thr His Tyr Val Leu Ala Pro Val Pro His Leu Gly Arg Ala Asp Val  
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Arg Ile Phe Ser Pro Ala Asp Phe Ser Thr Glu Leu Ser Ala His His  
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Gly Ser Ala Phe Ser Val Glu Pro Ile Leu Thr Gln Ser Ala Trp Phe  
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Asp Thr Asp Leu Ser Pro Glu Trp Leu Ala Arg Leu Ser Pro Ile Arg  
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Arg Gly Glu Trp Thr Asp Gln Glu Val Ala Phe Pro Asp His Ser Arg  
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Arg Leu Thr Thr Gly Tyr Gly Ser Ile Glu Ala Gly Ala Leu Ile Gly  
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Leu Leu Gln Gly Val Asp Leu Arg Trp Asn Thr His Val Ala Thr Leu  
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Asp Asp Thr Gly Ala Thr Leu Thr Asp Gly Ser Arg Ile Glu Ala Ala  
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Cys Val Ile Asp Ala Arg Gly Ala Val Glu Thr Pro His Leu Thr Val  
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<210> 28  
 <211> 726  
 <212> DNA  
 <213> Alcaligenes PC-1

<400> 28  
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 gctaaacaca tgaccaccca ccgtcacgct ggtaccgaca acgaccgga cttcggtcac 360  
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 ggtatcgggtg acccgctgct cctgctgacc tgcttccact tcgggtggta ccaccacgaa 660  
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 cgtgct 726

<210> 29  
 <211> 242  
 <212> PRT  
 <213> Alcaligenes PC-1

<400> 29

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Gly Leu Thr Ala Ala Ile Leu Leu Cys Trp Leu Val Leu His Ala Phe  
 20 25 30

Thr Leu Trp Leu Leu Asp Ala Ala Ala His Pro Leu Leu Ala Val Leu  
 35 40 45

Cys Leu Ala Gly Leu Thr Trp Leu Ser Val Gly Leu Phe Ile Ile Ala  
 50 55 60

His Asp Ala Met His Gly Ser Val Val Pro Gly Arg Pro Arg Ala Asn  
 65 70 75 80

Ala Ala Ile Gly Gln Leu Ala Leu Trp Leu Tyr Ala Gly Phe Ser Trp  
 85 90 95

Pro Lys Leu Ile Ala Lys His Met Thr His His Arg His Ala Gly Thr  
 100 105 110

Asp Asn Asp Pro Asp Phe Gly His Gly Gly Pro Val Arg Trp Tyr Gly  
 115 120 125

Ser Phe Val Ser Thr Tyr Phe Gly Trp Arg Glu Gly Leu Leu Leu Pro  
 130 135 140

Val Ile Val Thr Thr Tyr Ala Leu Ile Leu Gly Asp Arg Trp Met Tyr  
 145 150 155 160

Val Ile Phe Trp Pro Val Pro Ala Val Leu Ala Ser Ile Gln Ile Phe  
 165 170 175

Val Phe Gly Thr Trp Leu Pro His Arg Pro Gly His Asp Asp Phe Pro  
 180 185 190

Asp Arg His Asn Ala Arg Ser Thr Gly Ile Gly Asp Pro Leu Ser Leu  
 195 200 205

Leu Thr Cys Phe His Phe Gly Gly Tyr His His Glu His His Leu His  
 210 215 220

Pro His Val Pro Trp Trp Arg Leu Pro Arg Thr Arg Lys Thr Gly Gly  
 225 230 235 240

Arg Ala

<210> 30  
<211> 1261  
<212> DNA  
<213> *Alcaligenes* PC-1

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gccctgcatg tgcattgcgt gtggtttctg gacgcggcgg cgcattccat cctggcggtc 180  
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<211> 729  
 <212> DNA  
 <213> Unknown

<220>  
 <223> E-396

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 gcgcacccca tcctggcggt cgccaatttc ctggggctga cctggctgtc ggtcggctcg 180  
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 gcggcgatgg gccagcttgt cctgtggctg tatgccggat tttcctggcg caagatgatc 300  
 gtcaagcaca tggcccatca tcgcatgcc ggaaccgacg acgaccaga tttcgaccat 360  
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 ctgctgtctgc ccgtcatcgt gacggtctat gcgctgatgt tgggggatcg ctggatgtac 480  
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 cggatcagcg accccgtgtc gctgctgacc tgctttcaact ttggcgggta tcatcacgaa 660  
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 accgcatga 729

<210> 32  
 <211> 242  
 <212> PRT  
 <213> Unknown

<220>  
 <223> E-396

<400> 32

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Ile Val Ser Gly Gly Ile Ile Ala Ala Trp Leu Ala Leu His Val His  
 20 25 30

Ala Leu Trp Phe Leu Asp Ala Ala Ala His Pro Ile Leu Ala Val Ala  
 35 40 45

Asn Phe Leu Gly Leu Thr Trp Leu Ser Val Gly Leu Phe Ile Ile Ala  
 50 55 60

His Asp Ala Met His Gly Ser Val Val Pro Gly Arg Pro Arg Ala Asn  
 65 70 75 80

Ala Ala Met Gly Gln Leu Val Leu Trp Leu Tyr Ala Gly Phe Ser Trp  
 85 90 95

Arg Lys Met Ile Val Lys His Met Ala His His Arg His Ala Gly Thr  
 100 105 110

Asp Asp Asp Pro Asp Phe Asp His Gly Gly Pro Val Arg Trp Tyr Ala  
 115 120 125

Arg Phe Ile Gly Thr Tyr Phe Gly Trp Arg Glu Gly Leu Leu Leu Pro  
 130 135 140

Val Ile Val Thr Val Tyr Ala Leu Met Leu Gly Asp Arg Trp Met Tyr  
 145 150 155 160

Val Val Phe Trp Pro Leu Pro Ser Ile Leu Ala Ser Ile Gln Leu Phe  
 165 170 175

Val Phe Gly Ile Trp Leu Pro His Arg Pro Gly His Asp Ala Phe Pro  
 180 185 190

Asp Arg His Asn Ala Arg Ser Ser Arg Ile Ser Asp Pro Val Ser Leu  
 195 200 205

Leu Thr Cys Phe His Phe Gly Gly Tyr His His Glu His His Leu His  
 210 215 220

Pro Thr Val Pro Trp Trp Arg Leu Pro Ser Thr Arg Thr Lys Gly Asp  
 225 230 235 240

Thr Ala

<210> 33  
 <211> 486  
 <212> DNA  
 <213> Unknown

<220>

<223> E-396

<400> 33

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gaacacgacc acgcgctgga aaagaacgac ctgtacggcc tggctctttgc ggtgatcgcc      180
acggtgctgt tcacggtggg ctggatctgg gcaccgggcc tgtggtggat cgccttgggc      240
atgaccgtct acgggctgat ctatttcgtc ctgcatgacg ggctggtgca tcagcgctgg      300
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caccacgcgg tcgaggggcg cgaccattgc gtcagcttcg gcttcatcta tgcgccgccg      420
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cgcacg                                         486
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<211> 162

<212> PRT

<213> Unknown

<220>

<223> E-396

<400> 34

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Thr Ala Tyr Ser Val His Arg Trp Ile Met His Gly Pro Leu Gly Trp
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Gly Trp His Lys Ser His His Glu Glu His Asp His Ala Leu Glu Lys
                35              40              45

Asn Asp Leu Tyr Gly Leu Val Phe Ala Val Ile Ala Thr Val Leu Phe
50              55              60

Thr Val Gly Trp Ile Trp Ala Pro Val Leu Trp Trp Ile Ala Leu Gly
65              70              75              80

Met Thr Val Tyr Gly Leu Ile Tyr Phe Val Leu His Asp Gly Leu Val
                85              90              95
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His Gln Arg Trp Pro Phe Arg Tyr Ile Pro Arg Lys Gly Tyr Ala Arg  
 100 105 110

Arg Leu Tyr Gln Ala His Arg Leu His His Ala Val Glu Gly Arg Asp  
 115 120 125

His Cys Val Ser Phe Gly Phe Ile Tyr Ala Pro Pro Val Asp Lys Leu  
 130 135 140

Lys Gln Asp Leu Lys Thr Ser Gly Val Leu Arg Ala Glu Ala Gln Glu  
 145 150 155 160

Arg Thr

<210> 35  
 <211> 1253  
 <212> DNA  
 <213> Unknown

<220>  
 <223> E-396

<220>  
 <221> misc\_feature  
 <222> (911)..(911)  
 <223> unsure

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 gaacaccccg ccagctgac ggccaaagtc gatcatctga gtctgctcct cggcgctcga 180  
 ctcccttgatc acggccagca tctccagccc ggcgatgaac agcacgcccg tcttcaggtc 240  
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 gcctagcacg gcgcggcttt cgccatgcgc cacatgggtc gcgggctggc cgcggcgcac 480  
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 caccggggcg gtgttcgatc gatcaccagg catccggtgg ccatcgctc ggacagggac 1200  
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 <211> 882  
 <212> DNA  
 <213> Unknown

<220>  
 <223> E-396

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 tcgtcgggca agcgtttccg cggcatgctg atgtgcttg cggcagaagc ctcgggcggg 180  
 gtctgcgaca cgatcgtcga cgccgcctgc gcggtcgaga tggatcatgc cgcacgctg 240  
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 catgtggcgc atggcgaaag ccgcgccgtg ctaggcgga tcgccctgat caccgaggcg 360  
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 atgatcgact ttggccgtca gctgggcccgtgttccagt cctatgacga cctgctggac 660  
 gttgtgggcg accaggcggc gcttggcaag gataccggtc gcgatgcggc ggcccccggc 720  
 ccgcggcgcg gccttctggc cgtgtcagac ctgcagaacg tgtcccgta ctatgaggcc 780  
 agccgcgccc agctggacgc gatgctgcgc agcaagcgc ttcaggctcc ggaaatcgcg 840

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<210> 37  
<211> 293  
<212> PRT  
<213> Unknown

<220>  
<223> E-396

<400> 37

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Leu Glu Glu Ile Ala Gln Gly Phe Gly Ala Val Ser Gln Pro Leu Gly  
20 25 30

Pro Ala Met Ser His Gly Ala Leu Ser Ser Gly Lys Arg Phe Arg Gly  
35 40 45

Met Leu Met Leu Leu Ala Ala Glu Ala Ser Gly Gly Val Cys Asp Thr  
50 55 60

Ile Val Asp Ala Ala Cys Ala Val Glu Met Val His Ala Ala Ser Leu  
65 70 75 80

Ile Phe Asp Asp Leu Pro Cys Met Asp Asp Ala Gly Leu Arg Arg Gly  
85 90 95

Gln Pro Ala Thr His Val Ala His Gly Glu Ser Arg Ala Val Leu Gly  
100 105 110

Gly Ile Ala Leu Ile Thr Glu Ala Met Ala Leu Leu Ala Gly Ala Arg  
115 120 125

Gly Ala Ser Gly Thr Val Arg Ala Gln Leu Val Arg Ile Leu Ser Arg  
130 135 140

Ser Leu Gly Pro Gln Gly Leu Cys Ala Gly Gln Asp Leu Asp Leu His  
145 150 155 160

Ala Ala Lys Asn Gly Ala Gly Val Glu Gln Glu Gln Asp Leu Lys Thr  
165 170 175

Gly Val Leu Phe Ile Ala Gly Leu Glu Met Leu Ala Val Ile Lys Glu  
180 185 190

Phe Asp Ala Glu Glu Gln Thr Gln Met Ile Asp Phe Gly Arg Gln Leu  
195 200 205

Gly Arg Val Phe Gln Ser Tyr Asp Asp Leu Leu Asp Val Val Gly Asp  
210 215 220

Gln Ala Ala Leu Gly Lys Asp Thr Gly Arg Asp Ala Ala Ala Pro Gly  
225 230 235 240

Pro Arg Arg Gly Leu Leu Ala Val Ser Asp Leu Gln Asn Val Ser Arg  
245 250 255

His Tyr Glu Ala Ser Arg Ala Gln Leu Asp Ala Met Leu Arg Ser Lys  
260 265 270

Arg Leu Gln Ala Pro Glu Ile Ala Ala Leu Leu Glu Arg Val Leu Pro  
275 280 285

Tyr Ala Ala Arg Ala  
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<210> 38  
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<212> DNA  
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<223> Primer #7

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<212> DNA  
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<220>  
<223> Primer #8

<400> 39  
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<210> 40  
 <211> 391  
 <212> PRT  
 <213> Flavobacterium sp. R1534

<400> 40

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 20 25 30

Ala Ile Arg Ala Ala Leu Asn Gly Leu Ser Pro Asp Met Val Asp Glu  
 35 40 45

Val Leu Met Gly Cys Val Leu Ala Ala Gly Gln Gly Gln Ala Pro Ala  
 50 55 60

Arg Gln Ala Ala Leu Gly Ala Gly Leu Pro Leu Ser Thr Gly Thr Thr  
 65 70 75 80

Thr Ile Asn Glu Met Cys Gly Ser Gly Met Lys Ala Ala Met Leu Gly  
 85 90 95

His Asp Leu Ile Ala Ala Gly Ser Ala Gly Ile Val Val Ala Gly Gly  
 100 105 110

Met Glu Ser Met Ser Asn Ala Pro Tyr Leu Leu Pro Lys Ala Arg Ser  
 115 120 125

Gly Met Arg Met Gly His Asp Arg Val Leu Asp His Met Phe Leu Asp  
 130 135 140

Gly Leu Glu Asp Ala Tyr Asp Lys Gly Arg Leu Met Gly Thr Phe Ala  
 145 150 155 160

Glu Asp Cys Ala Gly Asp His Gly Phe Thr Arg Glu Ala Gln Asp Asp  
 165 170 175

Tyr Ala Leu Thr Ser Leu Ala Arg Ala Gln Asp Ala Ile Ala Ser Gly  
 180 185 190

Ala Phe Ala Ala Glu Ile Ala Pro Val Thr Val Thr Ala Arg Lys Val  
 195 200 205

Gln Thr Thr Val Asp Thr Asp Glu Met Pro Gly Lys Ala Arg Pro Glu  
 210 215 220

Lys Ile Pro His Leu Lys Pro Ala Phe Arg Asp Gly Gly Thr Val Thr  
 225 230 235 240

Ala Ala Asn Ser Ser Ser Ile Ser Asp Gly Ala Ala Ala Leu Val Met  
 245 250 255

Met Arg Gln Ser Gln Ala Glu Lys Leu Gly Leu Thr Pro Ile Ala Arg  
 260 265 270

Ile Ile Gly His Ala Thr His Ala Asp Arg Pro Gly Leu Phe Pro Thr  
 275 280 285

Ala Pro Ile Gly Ala Met Arg Lys Leu Leu Asp Arg Thr Asp Thr Arg  
 290 295 300

Leu Gly Asp Tyr Asp Leu Phe Glu Val Asn Glu Ala Phe Ala Val Val  
 305 310 315 320

Ala Met Ile Ala Met Lys Glu Leu Gly Leu Pro His Asp Ala Thr Asn  
 325 330 335

Ile Asn Gly Gly Ala Cys Ala Leu Gly His Pro Ile Gly Ala Ser Gly  
 340 345 350

Ala Arg Ile Met Val Thr Leu Leu Asn Ala Met Ala Ala Arg Gly Ala  
 355 360 365

Thr Arg Gly Ala Ala Ser Val Cys Ile Gly Gly Gly Glu Ala Thr Ala  
 370 375 380

Ile Ala Leu Glu Arg Leu Ser  
 385 390

<210> 41  
 <211> 388  
 <212> PRT  
 <213> Flavobacterium sp. R1534

<400> 41

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 Ile Gly Arg Val Gln His Gly Met Arg His His Arg Glu Gly Pro Arg  
 35 40 45  
 Arg His Gly Ala Arg Ala His Ser Glu Glu Leu Ala Ala Cys Pro Leu  
 50 55 60  
 Arg Lys Val Ala Pro Asp Arg Ala Val Phe Arg Cys Ser Asp Gly Pro  
 65 70 75 80  
 Asp Ala Arg Gly Pro Ala Leu Pro Arg Arg His Gln Arg Ile Ala His  
 85 90 95  
 Glu Pro Phe Arg Asp Asp Val Leu Ile His Gly Pro Ser Leu Gln Asn  
 100 105 110  
 Arg Ser Pro Ile Leu Ser Arg Asp Gly Ile Val Cys Asn Ala Pro Arg  
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 Gly Arg Val Phe Val Val Thr Gly Ala Ala Ser Gly Leu Gly Ala Ala  
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 Ser Ala Arg Met Leu Ala Gln Gly Gly Ala Lys Val Val Leu Ala Asp  
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 Leu Ala Glu Pro Lys Asp Ala Pro Glu Gly Ala Val His Ala Ala Cys  
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 Asp Val Thr Asp Ala Thr Ala Ala Gln Thr Ala Ile Ala Leu Ala Thr  
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 Asp Arg Phe Gly Arg Leu Asp Gly Leu Val Asn Cys Ala Gly Ile Ala  
 210 215 220

Pro Ala Glu Arg Met Leu Gly Arg Asp Gly Pro His Gly Leu Asp Ser  
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Phe Ala Arg Ala Val Thr Ile Asn Leu Ile Gly Ser Phe Asn Met Ala  
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Arg Leu Ala Ala Glu Ala Met Ala Arg Asn Glu Pro Val Arg Gly Glu  
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Arg Gly Val Ile Val Asn Thr Ala Ser Ile Ala Ala Gln Asp Gly Gln  
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Ile Gly Gln Val Ala Tyr Ala Ala Ser Lys Ala Gly Val Ala Gly Met  
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Thr Leu Pro Met Ala Arg Asp Leu Ala Arg His Gly Ile Arg Val Met  
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Thr Ile Ala Pro Gly Ile Phe Arg Thr Pro Met Leu Glu Gly Leu Pro  
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Gln Asp Val Gln Asp Ser Leu Gly Ala Ala Val Pro Phe Pro Ser Arg  
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Leu Gly Glu Pro Ser Glu Tyr Ala Ala Leu Leu His His Ile Ile Ala  
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Leu Val Val Asp Thr Gly Ala Glu Thr Leu Gly Phe Arg Val Glu Val  
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Ala Asp Ser Pro Glu Glu Arg Ala Gln Gly Leu Met Phe Arg Lys Glu  
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Leu Pro Ala Gly Thr Gly Met Leu Phe Ile Tyr Glu Ser Pro Gln Pro  
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Val Ser Phe Trp Met Arg Asn Thr Leu Ile Pro Leu Asp Met Val Phe  
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Leu Asp Glu Thr Pro Ile Pro Gly Ala Ala Val Gly Asp Pro Asp Pro  
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Asp Arg Leu Phe Val Leu Glu Ile Ala Gly Gly Glu Ala Asp Arg Leu  
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